TUTORIAL
SYSTEM SAFETY PROCESS MAPPING

2004 Annual Workshop on
Risk Analysis and Safety Performance Measurements in Aviation
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System Safety

Purpose and Scope

- Map your in-place safety programs to the System Safety Process (SSP) model
- Identify how you can make improvements
- Recognize why all of the steps of the SSP model are not part of your process

Hazard versus Risk

- Hazard: A condition, event, or circumstance that could lead to or contribute to an unplanned or undesired event.

- Risk: An expression of the impact of an undesired event in terms of event severity and event likelihood.

FAA Order 8040.4, Safety Risk Management
http://www.asy.faa.gov/Risk/Policy/Order8040-4.pdf

Why a Movement towards an FAA System Safety Process

- Traditional surveillance focussed on regulatory compliance.
- Successful in identifying problems to be fixed.
- Problems reflect deeper, systemic safety issues.
- Treating symptoms Vs. treating problems.
    - »*Reactive Vs. Proactive*

System Safety Commonalties in FAA

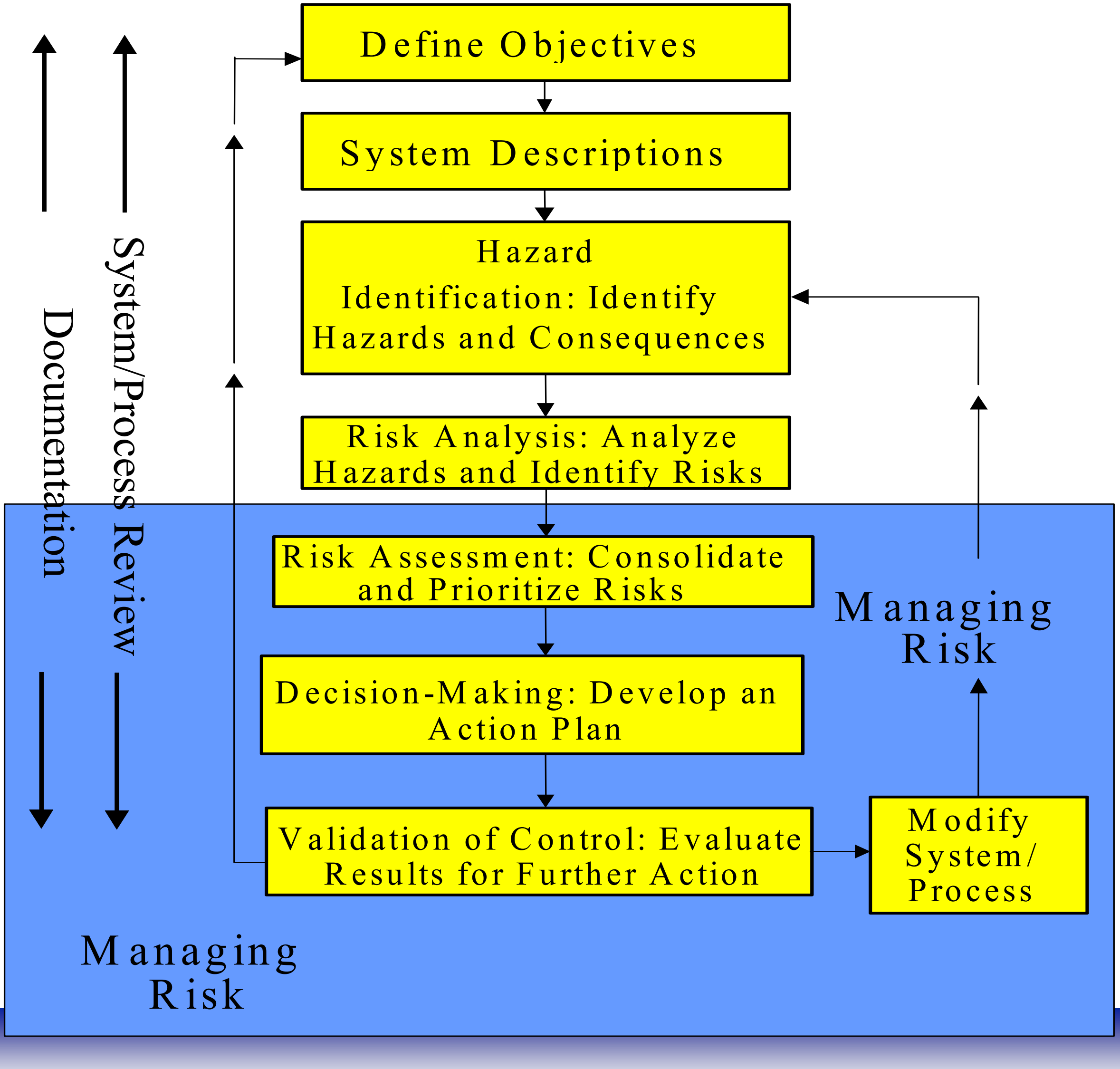
The following key factors are common to FAA's approach to Safety Risk Assessment.

- Mil-Std 882 / FAA AC 25.1309-1A
- Risk Ranking Matrix
- Identification of Existing Controls
- Accurate Data Reporting
- Understanding organization culture
- Communicating risks to the public

An FAA Standard Risk Management Process

- Document the System Safety approach
- Identify hazards
- Assess safety-related risk
- Identify risk mitigation measures.
- Reduce safety-related risk to an acceptable level.
- Verify and validate risk mitigation.
- Review hazards & acceptance of residual risk.
- Hazard tracking, their closures and residual risk.

System Safety Process


Documentation
System/Process Review
Define Objectives
System Descriptions
Hazard Identification: Identify Hazards and Consequences
Risk Analysis: Analyze Hazards and Identify Risks
Risk Assessment: Consolidate and Prioritize Risks
Managing Risk
Decision-Making: Develop an Action Plan
Validation of Control: Evaluate Results for Further Action
Modify System/ Process
Managing Risk

How Do We Get To a System Safety Process?

- Understand where our safety programs have been
- Identify where they may be today
- See where we want them to go
- Know what we need to do to improve them

Mapping Your Safety Programs

- Understand the steps of the System Safety Process Model
- Map your in-place safety program processes to the model
- Identify how you can make improvements
- Recognize why all of the steps are not part of your process

Mapping Exercises

- *Purpose*: show how a carrier's multiple safety programs may already contribute to a level of safety and how those programs may benefit from a ***disciplined*** system safety/risk mgmt approach.
  - If steps of the system safety process are not identified within ***their*** processes, the carrier should, at a minimum, understand why not?

➢ ***Note*** *: its not uncommon to discover that three steps of the model: risk analysis, risk assessment, and validation / feedback, are missing.*

SYSTEM SAFETY PROCESS

Mapping Exercise Example

Safety Committee Meetings

Safety Action Group

Corporate Goals

Annual Safety Review

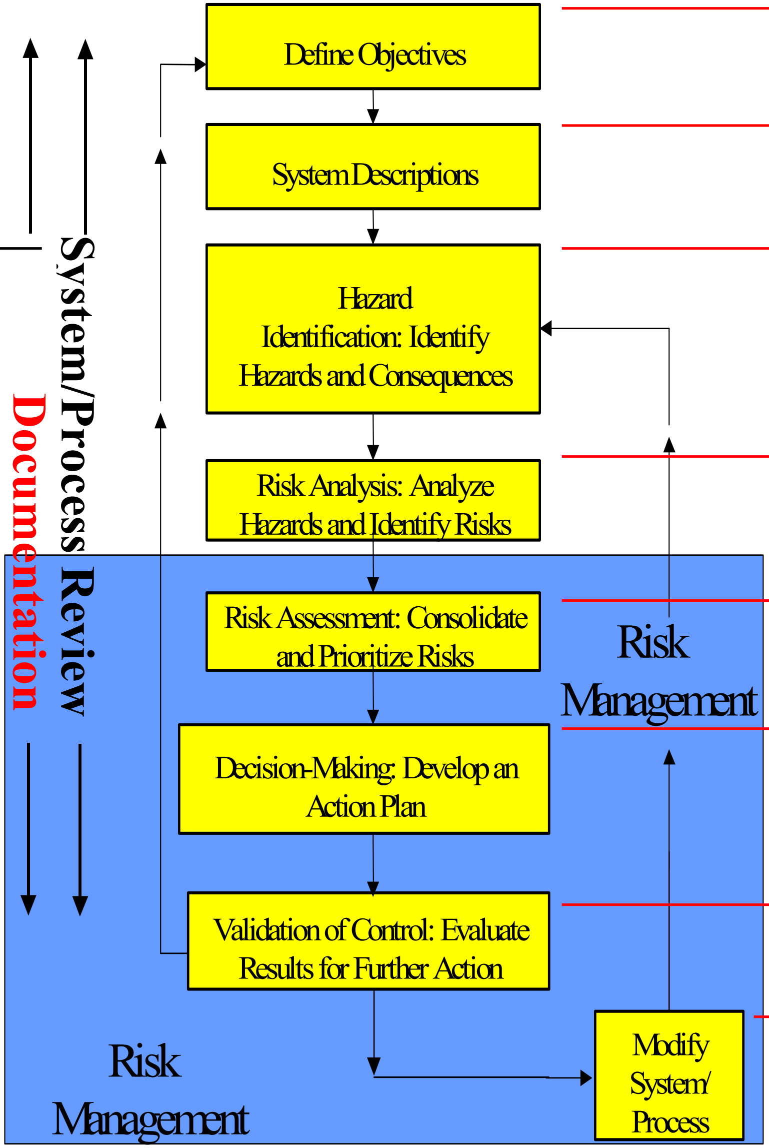
Audits

Safety Program Files

Reports

Databases

Audit Files



System/Process Review

Documentation

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Risk Management

Risk Management

FAA (CFR, Orders, HBAT)

Corporate Goals

Safety Manual

Safety Awareness Program

ASRP Acc/Inc Ground Safety Program

SDR Hotlines Station Action Committees

MIS Suggestions IEP FOQA ASAP

Five-step Hazard Investigation

Root Cause Analysis

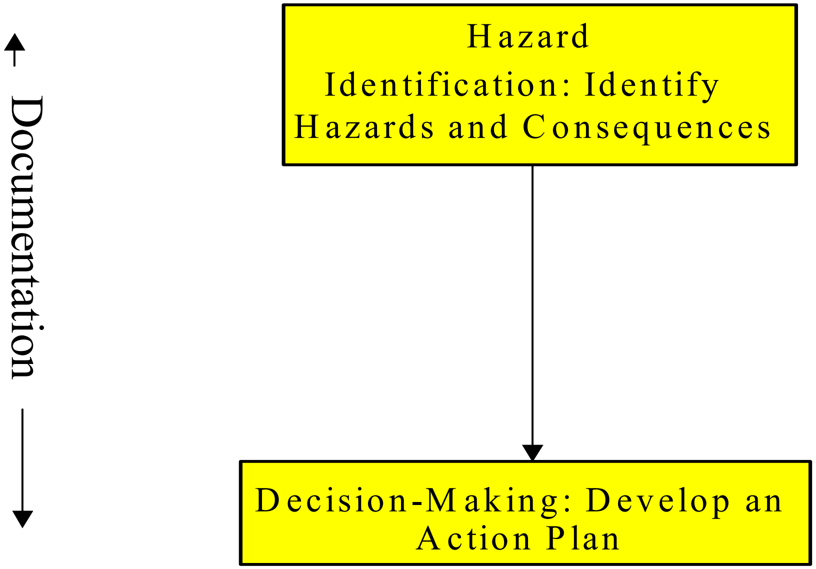
Audit Process Weekly Trend Analysis

Audit Process Weekly Trend Analysis

Annual Safety Review Graphs

Safety Committee Meetings

Hazard Control
(Fly-Fix-Fly)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Hazard Identification: Identify Hazards and Consequences
Decision-Making: Develop an Action Plan

Hazard Identification: Identify Hazards & Consequences

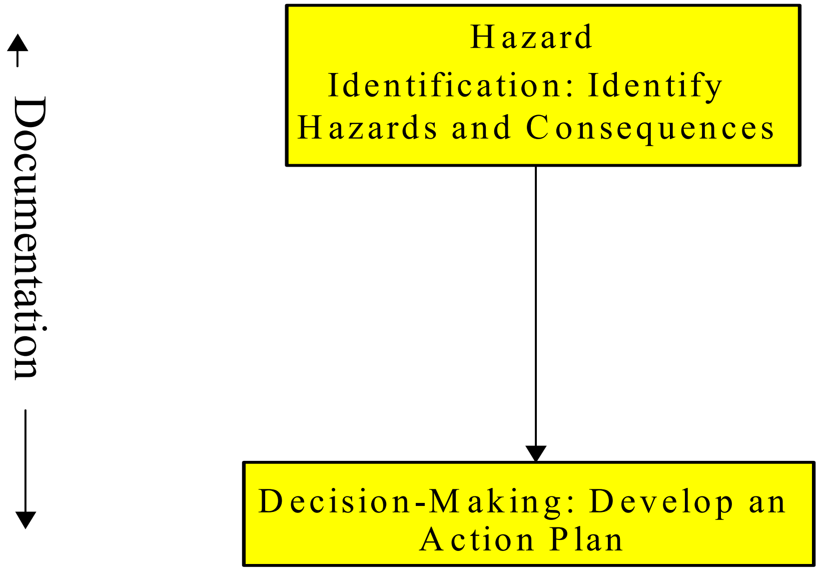
- Potential hazards may be identified from a number of internal and external sources.
- Initially listed on a Preliminary Hazard List (PHL) then grouped by functional equivalence for analysis.
- Also include the consequence (undesired event) resulting from the hazard scenarios.

Decision Making: Develop Action Plans

- Generally four options (T.E.A.M.)
  - Transfer
  - Eliminate
  - Accept
  - Mitigate
- Follow the “Safety Order of Precedence":
  - Design for minimum risk
  - Incorporate safety devices
  - Provide warning devices
  - Develop procedures and training

Hazard Control

(Fly-Fix-Fly)



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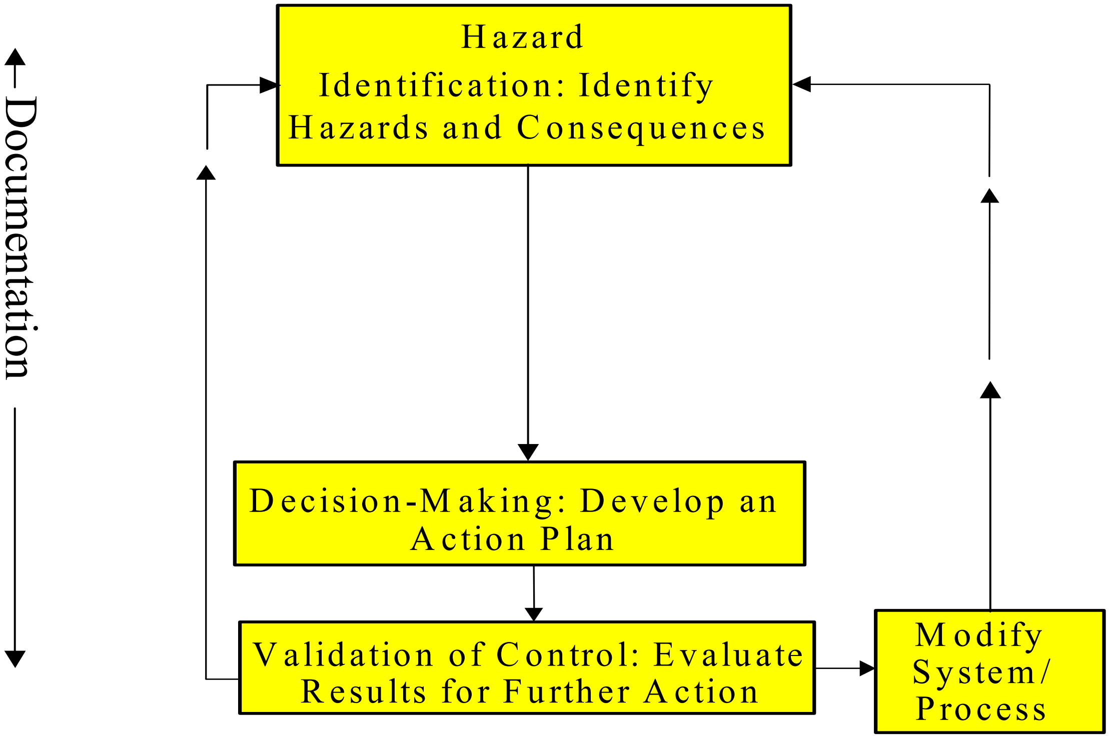
Decision-Making: Develop an Action Plan

Hazard Control Management



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Validation of Control: Evaluate Results for Further Action

Modify System/ Process

Validations and Control: Evaluate Results of Action Plan for Further Action

Validation and Verification

Is this still a hazard?

- Has the control been implemented?
- Is the control having its intended effect?
  - If "Yes", then document and continue to monitor
  - If "No", then choose a different control
  - Were any new hazards introduced?

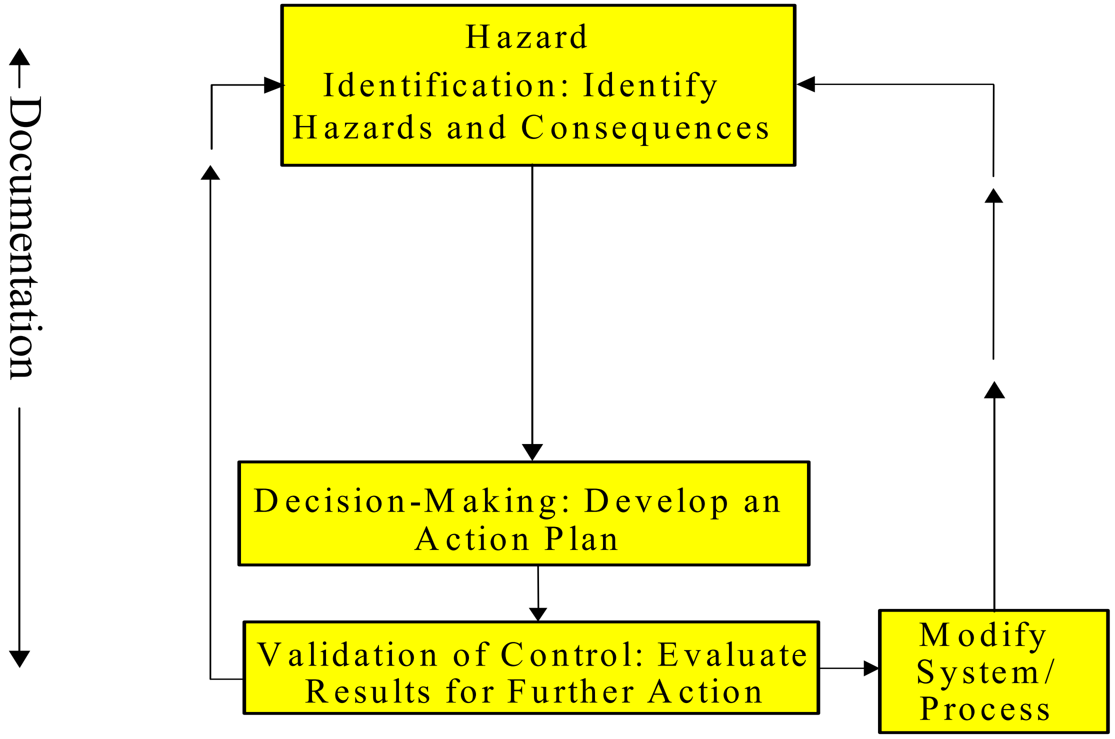
Modify System/Process (If needed)

If the mitigating action does not produce the intended effect, you must determine WHY.

- Are you addressing the wrong hazard?
- Did you introduce a new hazard?

In either case, one would then re-enter the system safety process at the hazard identification step.

Hazard Control Management



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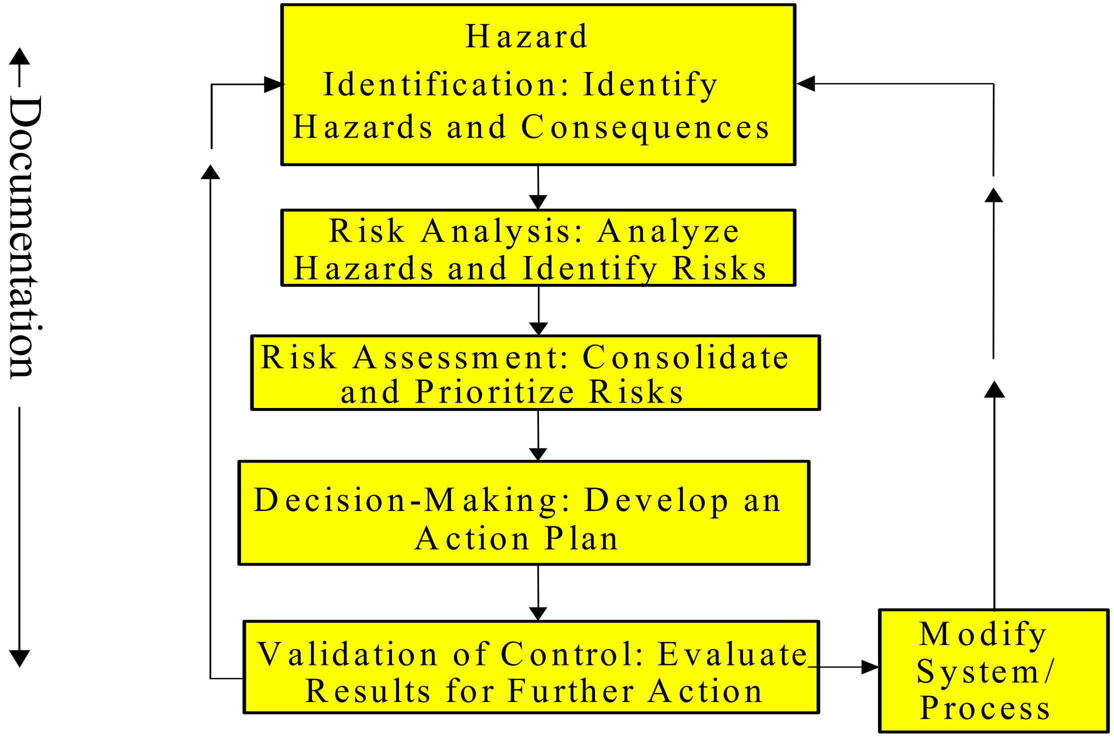
Risk Management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Risk Analysis: Analyze Hazards and Identify Risks

- Risk analysis is the process whereby hazards are characterized for their likelihood and severity.
- Risk analysis looks at hazards to determine **what** can happen **when**.
- This can be either a qualitative or quantitative analysis. The inability to quantify and/or the lack of historical data on a particular hazard does not exclude the hazard from the need for analysis.

Risk Assessment: Consolidate & Prioritize Risks

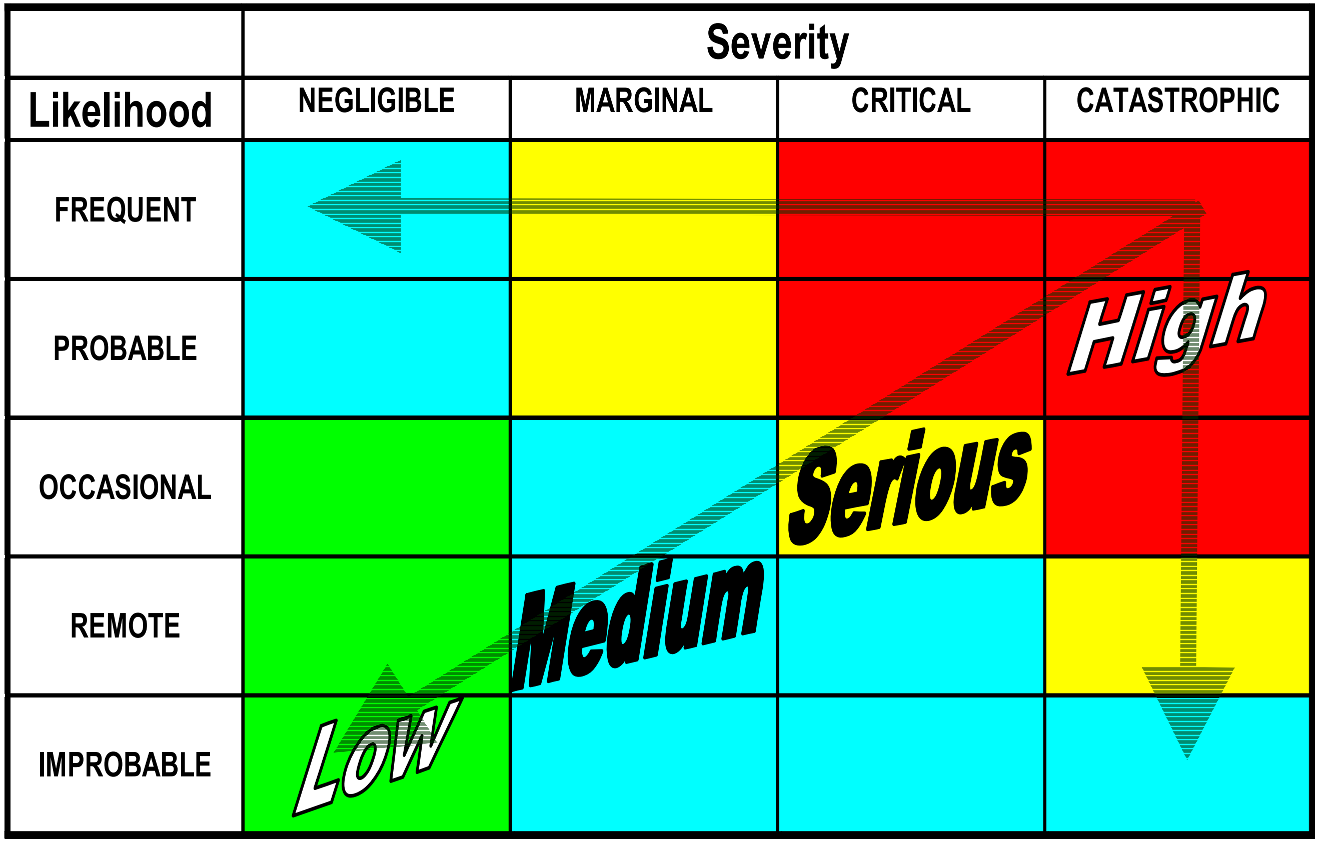
- Process of combining the impacts of risk elements discovered in risk analysis and comparing them against some acceptability criteria.
- Can include the consolidation of risks into risk sets that can be jointly mitigated. The results of this comparison are used in decision making.

Safety: More than the absence of accidents

- Safety is the goal of transforming the severity and likelihood of risk that is inherent in all human activity to lower, acceptable levels.

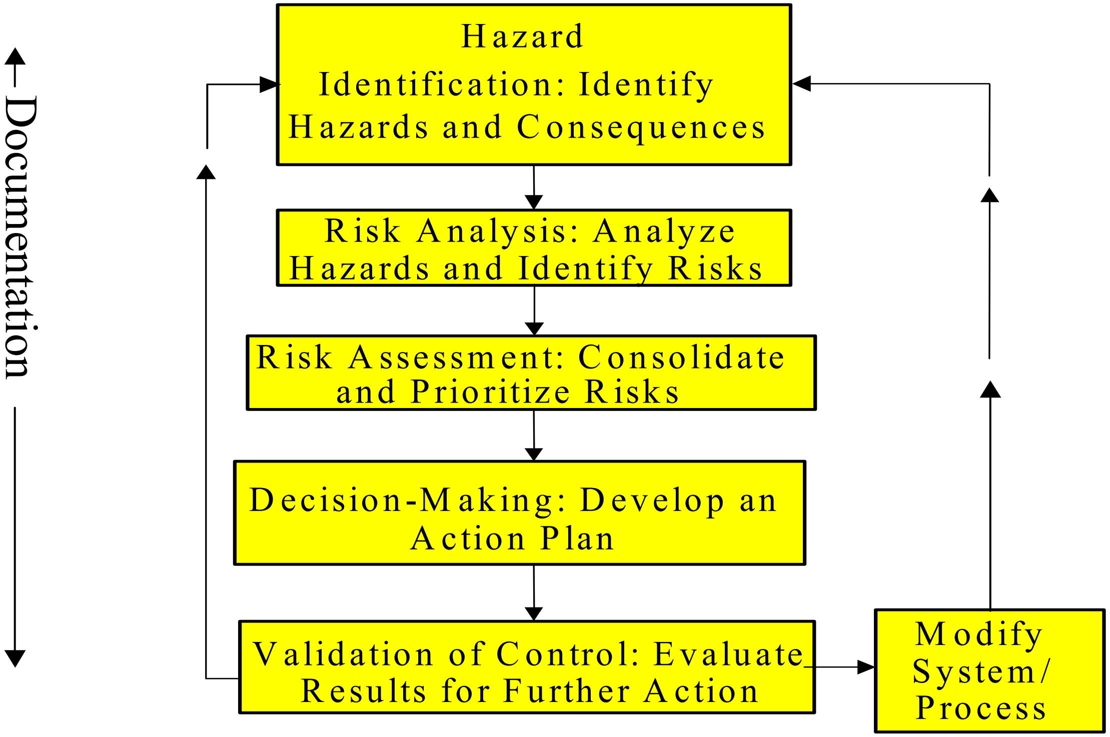
Patterns In Safety Thinking: A Literature Guide to Air Transportation Safety. McIntyre

RISK ACCEPTABILITY



	Severity			
Likelihood	NEGLIGIBLE	MARGINAL	CRITICAL	CATASTROPHIC
FREQUENT	🟦	🟨	🟥	🟥
PROBABLE	🟦	🟨	🟥	🟥
OCCASIONAL	🟩	🟦	🟨	🟥
REMOTE	🟩	🟦	🟦	🟨
IMPROBABLE	🟩	🟦	🟦	🟦

Risk Management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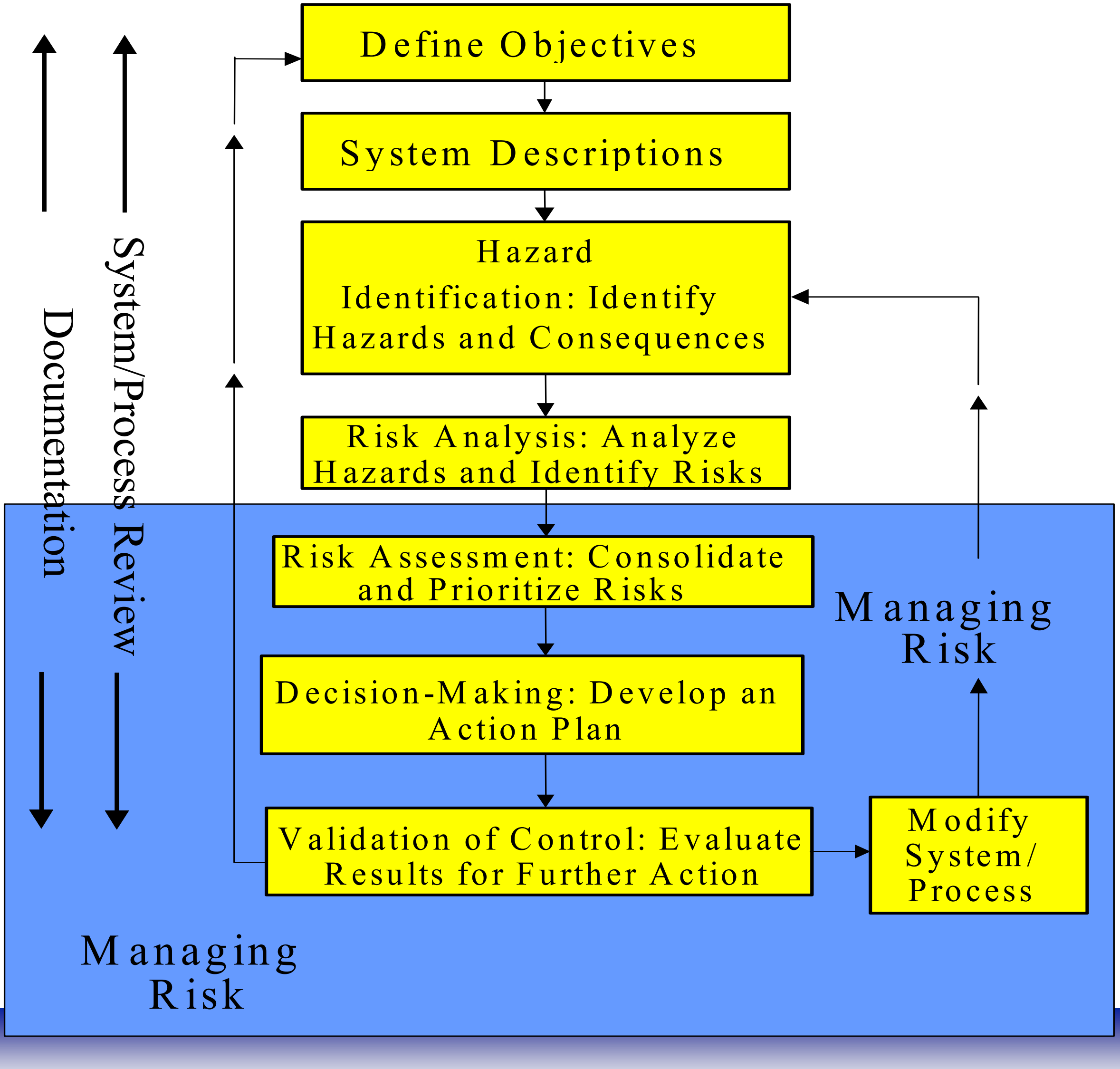
System Safety Process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Complete Mapping Exercise

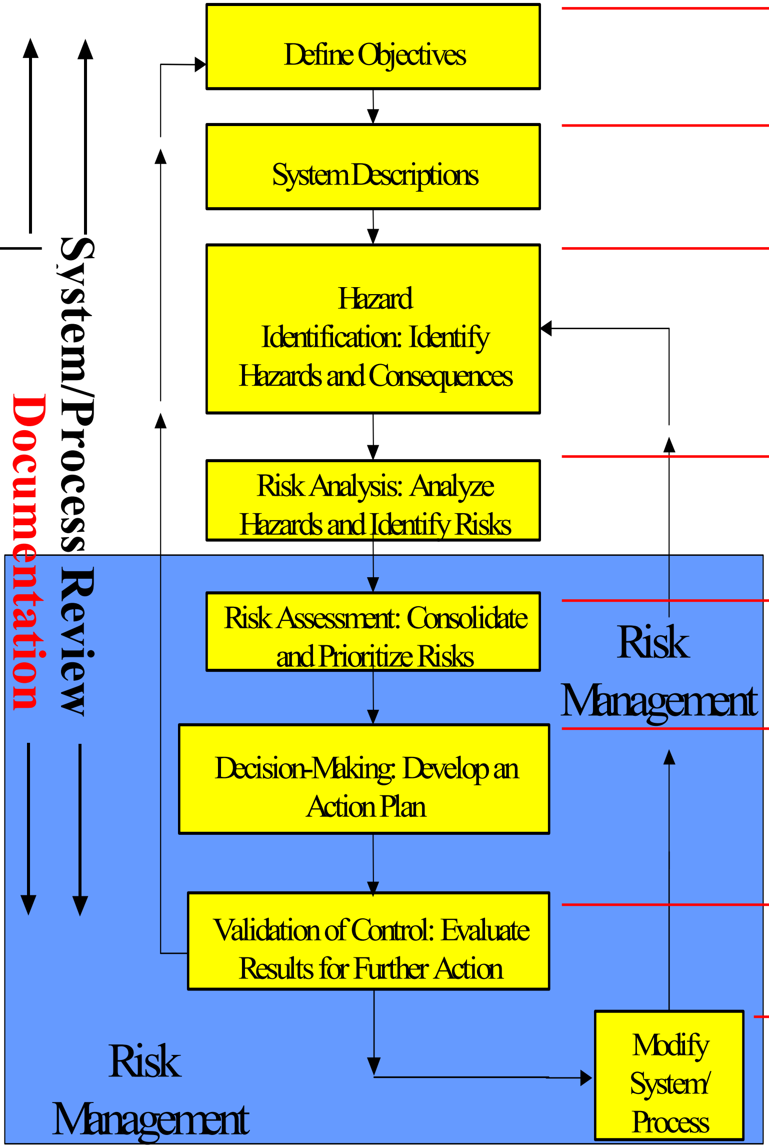
- Don’t start from scratch
- Map your safety program processes to the steps in the model
- Identify how to improve your safety program

~ or ~

- Understand why all of the System Safety steps are not part of your process

SYSTEM SAFETY PROCESS

Mapping Exercise Example



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Why Implement System Safety?

- Facilitates an integrated and singular corporate safety program by looking at the whole system.
- Accident rate reduction goal requires a system-wide analytical capability—beyond component failure analysis.
- Provides the means to assess safety related risks. Most incidents/accidents occur at the transition interfaces–human;computer/human;O&M etc.

Safety Benefits

- Industry
  - Controlling costs (Accidents are involuntary and unscheduled expenditures).
  - Conserves resources (If you think safety is expensive, try having an accident).
  - Achieving organizational goals (may lose people, equipment, business and reputation).

Safety Benefits

- Regulator
  - Better risk communication with industry
  - Better use of FAA resources
  - Achieve higher level of safety

Any Questions or Comments?

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